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Research Article

Reverse Microvascular Surgery - a New Paradigm

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Abstract

Classically, a pedicle flap from harvesting to division & inset of flap takes 3 weeks to sometimes 4 weeks if flap delay is done before division of flap. Whereas microvascular free flap can be performed in single day. Moreover, with addition of escalator/lift concept in ladder of reconstruction, microvascular single stage flap is possible & favored. But there are reasons when even, if possible, microvascular flap is not done. In this study, author discuss these reasons/factors when single stage microvascular flap though not possible but still can be performed in two to three stages of each 2 hours duration. Further, author proposes a new paradigm of doing microvascular flap by converting single stage microvascular flap (of usual duration of approx 6 hours on an average) into multiple (two to three stages) of maximum two hours of duration. This study highlights the experience of performing one microvascular flap in three stages of each 2 hours duration for a case of post burn contracture deformity of left foot as patient refused for prolonged anesthesia required for single stage microvascular.

Keywords: single stage; microvascular; free flap; multiple stages

Introduction

Classically, a pedicle flap from harvesting to division & inset of flap takes 3 weeks to sometimes 4 weeks if flap delay is done before division of flap. Whereas microvascular free flap can be performed in single day. Moreover, with addition of escalator/lift concept in ladder of reconstruction, microvascular single stage flap is possible & favored (figure 1). But there are reasons when even, if possible, microvascular flap is not done. In this study, author discuses these reasons/factors when single stage microvascular flap though not possible but still can be performed in two to three stages of each 2 hours duration. Further, author proposes a new paradigm of doing microvascular flap by converting single stage microvascular flap (of usual duration of approx 6 hours on an average) into multiple (two to three stages) of maximum two hours of duration of each stage over a period of 4 days (for two stages) to 7 days (for three stages).

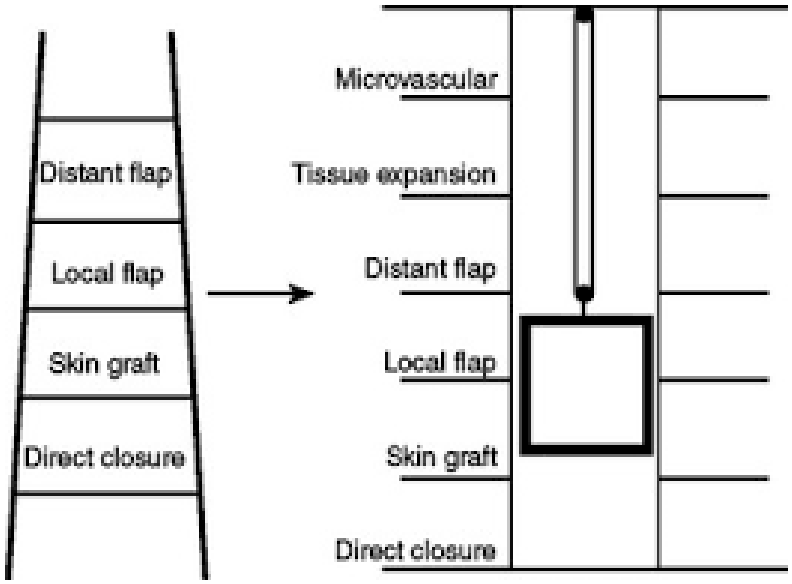

Figure 1: Ladder of reconstruction with concept of escalator/lift

Various indications & reasons proposed by authors for converting single stage microvascular flap into multiple stages are:

1. Patient related factors
   - refusing for prolonged anesthesia
   - unexpected intraoperative complications like hypotension, excessive blood loss, etc.

2. Surgeon related factors

- In a teaching institute independent surgery has to be given to a surgical trainee & operating surgical trainee is likely to take more than expected duration of surgery which may increase risk to patient due to prolonged anesthesia requiring post operative ventilator care with risk of ventilator associated complications like ventilator associated pneumonia, etc.

- Single operating surgeon without dedicated microvascular team will invariably take prolonged surgery time including surgeon exhaustion factor.

- Re-exploration of flap may be avoided due to risk factors like hypothermia, hypotension, prolonged anesthesia drug effects when microvascular surgery is performed in single stage.

- old age surgeons and surgeons with comorbidities like backache, vision problems.

3. Hospital related factors

- Shortage of operating tables in a public govt hospital due to which one long microvascular surgery often leads to cancellation of other waiting patients.

- Shortage of anesthetists even though operating tables available.

- Shortage blood bank facility.

This study highlights the experience of performing one microvascular flap in two stages of each 2 hours duration over a period of 4 days with gap of two days between each stage for a case of post burn contracture deformity of left foot as patient refused for prolonged anesthesia required for single stage microvascular.

Materials and methods

This study was conducted in the Department of Plastic Surgery at a tertiary care center after getting the departmental ethical committee approval. The patient in study was normal 12 years back at the 3 years of age when he had an accidental scald burn injury (rice water and spill) over his left hand, left leg, and both feet. The burn site was washed with water and admitted to a local hospital for 15 days and was managed with intravenous fluids, dressing, and antibiotics. There is no history of use of splint or physiotherapy. After discharge, the dressing was done at home only. Six months after discharge patient developed left foot dorsal contracture deformity which progressively increased with age (figure 2). No other treatment was taken for burn deformity. The deformity affected his daily routine activities including walking, not able wear shoes, etc. Patient now reported to hospital for correction of the contractures of right foot. The surgical plan was to release the contracture & cover with microvascular flap in two stages of each two hours duration over a period 4 days with a gap two days between each stage. After obtaining informed consent from patient & fitness from anesthetists, in first stage, contracture was released, free microvascular right anterolateral thigh flap was harvested & lateral circumflex femoral vessels were prepared and anastomosis site vessels in right foot was also prepared (figure 3 & 4). After two days vessels anastomosis & flap inset was done. Anterior thigh site was closed primarily. End to side anastomosis was done between left anterior tibial artery & lateral circumflex femoral artery using 9.0 monofilament suture. End to end anastomosis was done between lateral circumflex femoral vein & right anterior tibial vein using 9.0 monofilament suture (figure 5).

Figure 2: Post Burn Deformity of Right foot

Figure 3: In first stage recipient vessels prepared in Right foot

Post operative period was uneventful. No complication was noted.

Figure 4: In first stage right side microvascular Antero Lateral Thigh flap harvested & vessels prepared

Figure 5: Right free microvascular Antero Lateral Thigh flap after anastomosis & inset over right foot region

Discussion

Contractures are an abnormal occurrence that happens when a large area of skin is damaged and lost resulting in a scar. The scar formation pulls the edges of the skin together causing a tight area of skin. The decrease in the size of the skin can then affect the muscles, joints, and tendons, causing a decrease in movement.[1] A combination of factors likely contributes to postburn contracture formation includes:

1) injury-related factors include the depth, extent, cause and location of burn;

2) patient-related factors include genetic, race, skin color, age, sex, nutritional status, and compliance with therapy; and

3) treatment-related factors including the type and timing of wound closure, the wound bed, and prevention strategies utilized.[2]

There are many different surgical treatment options for contractures such as cover by skin graft, local flaps, pedicled flaps or free flaps after releasing the contracture.[3,4] Microvascular free flap reconstruction is a surgical procedure that involves the transfer of tissue along with its blood vessels from one part of the body to another. This technique is commonly used in reconstructive surgery to repair defects or restore function in areas affected by trauma, cancer, or congenital abnormalities. The tissues' blood vessels are reconnected to local vessels at the recipient site using microsurgical techniques ensuring adequate blood supply and promoting successful healing. Lateral circumflex femoral artery (LCFA) flap is evolved form of a traditional anterolateral thigh flap because of its thinness, pliability and the concealed donor site and is an ideal option for single stage reconstruction of leg defects obscuring the need for discomforting passive foot position, joint stiffness and unexpected flap avulsion which were associated with traditional groin flap.[5,6,7] Generally all the free flap cases are done in single stage but in our case we have done in multiple (two) stages as described in materials & methods section as patient didn't agree for single stage microvascular flap. Although it is done in two stages still the total time taken was only over a period of four days compare to conventional pedicle flap which would have taken 3 to 4 weeks. This way, microvascular flap still can be done in spite of various reasons otherwise not possible as mentioned above in the introduction section. The problem in this way of doing single into multiple stages include need for repeated intubation which even can be avoided if done in regional anesthesia allowing other cases to be operated same operation theatre day which otherwise would have been cancelled due to long single stage free microvascular flap over 6 to 8 hours duration. Limitation of this study is that it's a single case report & large multicenter study is required to validate the proposed new paradigm suggested by authors.

Conclusion

In an era of microvascular surgery, author proposes a new paradigm of breaking single stage microvascular free flap into multiple stages for various reasons but need validation by other centers. This is new paradigm of author in field of microvascular reconstructive surgery.

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